

Updated defense display market assessment *

Daniel D. Desjardins and Darrel G. Hopper

Air Force Research Laboratory

Address: Bldg 248 Rm 300, 2255 H Street, Wright-Patterson AFB OH 45433-7022 USA
Telephone: 937/255-4079 Fax: 937/255-8366 E-mail: ddesjardins@falcon.al.wpafb.af.mil

ABSTRACT

This paper addresses the number, function and size of principal military displays and establishes a basis to determine the opportunities for technology insertion in the immediate future and into the next millennium. Principal military displays are defined as those occupying appreciable crewstation real-estate and/or those without which the platform could not carry out its intended mission. DoD "office" applications are excluded from this study. The military displays market is specified by such parameters as active area and footprint size, and other characteristics such as luminance, gray scale, resolution, angle, color, video capability, and night vision imaging system compatibility. Funded, future acquisitions, planned and predicted crewstation modification kits, and form-fit upgrades are taken into account. This paper provides an overview of the DoD niche market, allowing both government and industry a necessary reference by which to meet DoD requirements for military displays in a timely and cost-effective manner. The aggregate DoD installed base for direct-view and large-area military displays is presently estimated to be in excess of 313,000. Miniature displays are those which must be magnified to be viewed, involve a significantly different manufacturing paradigm and are used in helmet mounted displays and thermal weapon sight applications. Some 114,000 miniature displays are presently included within future weapon system acquisition plans. For vendor production planning purposes it is noted that foreign military sales could substantially increase these quantities. The vanishing vendor syndrome (VVS) for older display technologies continues to be a growing, pervasive problem throughout DoD, which consequently must leverage the more modern, especially flat panel, display technologies being developed to replace older, especially cathode ray tube, technology for civil-commercial markets. Total DoD display needs (FPD, HMD) are some 427,000.

1. INTRODUCTION

It is currently predicted that the flat panel display (FPD) component market will grow from \$9.4 billion in 1995, to \$22.5 billion by 2001, with market share of flat panel technology to remain over 86% liquid crystal display (LCD) oriented throughout this period.^{1,2} Because it is no longer a case of if, but when, flat panel technologies will come to the fore of military applications, it is imperative to assist decision makers both in government and the private sector to understand the magnitude of need as well as the timeline of opportunity for flat panel insertion into DoD fleets and foreign military sales. This paper provides a select number, by type, of existing platforms in the DoD operational inventory (plus, where available, those in foreign operational inventories), the type and number of on-contract future platforms coming into the inventory (or allocated to foreign sales), the timeline for their delivery, retirement or upgrade, and the number and character of displays each system utilizes or requires. By knowing this information now, on a DoD and foreign defense fleet-wide basis, the opportunity will be created for application of both government incentives and industry investment to prepare the groundwork for a timely response to military flat panel demand. Also, such timely decision-making now can minimize the costly and disruptive effects of the vanishing vendor syndrome (VVS) for older display technologies in fielded systems.

"Demand" relative to the DoD displays market is defined herein to be the number of displays of a given active area which are currently in a weapon system and will remain in operation long enough to experience at least one technology insertion, else will

* Publication Citation: D.D. Desjardins and D.G. Hopper, "Updated defense display market assessment," in *Cockpit Displays VI: Displays for Defense Applications*, Darrel G. Hopper, Editor, SPIE 3690, 2-25 (1999).

Report Documentation Page			Form Approved OMB No. 0704-0188	
<p>Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.</p>				
1. REPORT DATE 1999	2. REPORT TYPE N/A	3. DATES COVERED -		
4. TITLE AND SUBTITLE Updated Defense Display Market Assessment			5a. CONTRACT NUMBER	
			5b. GRANT NUMBER	
			5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)			5d. PROJECT NUMBER	
			5e. TASK NUMBER	
			5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Air Force Research Laboratory Wright Patterson AFB, OH 45433-7022			8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)	
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited				
13. SUPPLEMENTARY NOTES				
14. ABSTRACT				
15. SUBJECT TERMS				
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT UU	18. NUMBER OF PAGES 29
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified		

be an installed production item as part of an anticipated future acquisition funded by Congress.

The characterization of the DoD display market depends upon the authorized force structure and system mix. However, we have observed that the aggregate DoD FPD demand is growing even though DoD is downsizing for two reasons: (1) the VVS for CRTs and electromechanical (EM) displays; (2) the 12:1 return on investment (ROI) for FPDs. A weapon system is of no value if, due to unavailable displays, it cannot be delivered by a material command (e.g., AFMC, USAMC, SPAWAR) to a train/equip command (e.g., ACC, AMC, AETC) or, in turn, dispatched by a train/equip command to a commander-in-chief (CINC for USSOCOM, USTRANSCOM, NORAD, CINCPAC, et al.), or, in turn, used by a CINC for missions. The VVS for displays is beginning to cause such a problem. At the same time nascent new technologies require some investment to meet DoD needs.

We recognize a responsibility to the warfighter, the maintenance establishment, and the taxpayer [in that order]. Warfighters operate DoD systems, put their lives at risk, and are, therefore, our first consideration. Bringing military flat panel displays into the DoD inventory on a timely basis will serve the warfighter by providing a more mission capable piece of equipment which reduces crew workload while substantially improving situational awareness and combat exchange ratios. The maintenance establishment is served by reducing workload and need for spares due to a mean time between failure (MTBF) rate at least two orders of magnitude better than the out-going technologies. The taxpayer is served, first by decreasing DoD lifecycle cost expenditures, and second, by ultimately reducing the projected number of platforms (fleet sizes) necessary to achieve the fleet availability, sortie rates, and operational tempo needed to satisfy national military objectives.

2. DEFENSE DISPLAY MARKET ASSESSMENT

The method for gathering information into this paper was both "broad-spectrum" and "narrow-band." The "broad-spectrum" approach consisted in surveying reputable periodicals. The "narrow-band" approach entailed fax, e-mail, telephonic, and face-to-face inquiries to representatives of U.S. Army, Navy, Marines, Air Force and contractor programs regarding individual platforms. Dates, names, duty titles, office symbols, and telephone, fax, and/or e-mail numbers of sources are given in the endnotes of a new technical report AFRL-HE-WP-1998-0017 (Mar 98) by Desjardins and Hopper entitled "Military Display Market: First Comprehensive Edition" (see Ref. 1a). See also the 1998 SPIE paper by Desjardins and Hopper (Ref. 2).

We reviewed, edited and recorded reliable pieces of information on every DoD cockpit, crew-station, control center, training system and portable device covered by major publication sources. Information sought pertained to number and kind of display hardware per combat platform, schedules of development and delivery, display module footprint, bezel measurement, and active-area size. Congressional or programmatic decisions affecting these platforms is noted. Where possible, ancillary characteristics are noted of existing or upgrade displays regarding technology base, resolution, color, gray scale, NVIS compatibility, angle-of-view, video, and luminance. Where necessary, system details were obtained through direct contact with acquisition and logistic program offices, and private industry contractors. Aside from this activity, two primary government publications were used as reference: the USAF *Avionics Planning Baseline*³ and the Navy *Avionics Installation Plan*.⁴ Edited textual information from all sources became the basis for the appendices. Data extracted from the appendices on platform fleet strengths, numbers of displays by function per platform, and display size became part of the report section entitled "Results." Yet other information was extracted from the combat platforms data base to provide information for the "Discussion," including platform operational retention dates, new-platform or upgrade delivery dates, and definition of acronyms. Then each platform fleet was analyzed for total number of displays by size, and the results were tabulated across all DoD systems. It is this latter capstone effort which led to the six tables presented in this paper. The "Discussion" and "Conclusions" sections, however, draw upon all information available for the some 427,000 total DoD display needs analyzed.¹

It is expected that every DoD military platform planned for retention beyond the year 2009 will experience at least one form-fit-function or other display upgrade during its remaining life-cycle. Complete cockpit or crewstation redesigns can be anticipated for every 30 years of lifecycle. Most DoD inventory systems are now at or past their 10-20 year milestones and are in need of upgrade or replacement during the next 10-15 years based on technology of the future (FPD) rather than the past (CRT, electromechanical). The likelihood that any given combat platform display upgrade program will make the decision to transfer from existing CRT and electromechanical (EM) display interfaces to those incorporating flat panel technologies becomes ever more certain as time and experience proves this latter approach superior in terms of performance, reliability and lifecycle maintenance cost. A pervasive shift is underway toward such new display technology insertion, with over 45% of the 313,000 DoD weapon system installed displays having elected to convert. A proper study of the Quadrennial Defense Review results

will determine which platforms, to what level and over what time frames, future technology insertions can be expected.

The epochal transition from CRTs to FPDs means that technological insertions will occur more rapidly over the next ten years than at any time since the introduction and perfection of the CRT from the 1940s through the early 1980s. Furthermore, the extremely rapid evolution now underway in FPD technologies requires pre-programmed product improvement (P3I) technology insertion points for many weapon systems to upgrade their FPD technology every few years during production and retrofit programs.

3. RESULTS

The information presented here derives from an extensive platform data base in which displays are listed by type, size, number per platform, number of platforms per operational inventory, total number of displays per fleet, and technology base.¹ For CRT or flat panel based displays, the size is that of the active area, either as a width by height, diagonal or diameter. For EM displays the active area or bezel measurement is given instead (examples include the avionics attitude direction indicator (ADI), horizontal situation indicator (HSI), or bearing-heading-direction indicator (BHDI)). The first step in the analysis is the grouping displays from various programs according to active area or bezel measurement. These intermediate results are then assessed to see which sizes represent the most significant DoD demand and which proximate sizes might lend themselves to a form-fit or redesign effort so as to achieve commonality. The program requirements regarding ancillary requirements (luminance, gray level, viewing angle, resolution, etc.) is also generally taken into account.

Existing DoD display sizes having quantities of 5,000 units or greater are tabulated in detail in Table I.

Existing DoD display sizes being used in 10 or more weapon systems programs are listed in Table II.

Tables III and IV show how existing display areas cluster about selected sizes, 10 in. and 19.5 in., respectively. Mechanical design changes might make some reduction in unique items possible for displays in a cluster.

DoD display sizes unique to a single platform (but multiple copies per platform) are listed in Table V.

Singularities are listed in Table VI. These displays exist in a quantity of one (1) in DoD.

Tables I and II are updates to the same tables of our 1998 SPIE paper (Ref. 1b).

Tables III-VI present new perspectives into the DoD military display market.

Table I. Display sizes having aggregate defense applications of five thousand units or greater.

Display Size, mm (in.) H x V	Platform Diagonal	No.	Total	Current Technology	Comment
30.16 x 17.46 (1.1875 x 0.6875)	M1A1	4327		LED	
	M1A2	392		LED	
	M1A2SEP	792	5511	LED	
37.59 x 17.53 (1.48 x 0.69)	M1	382		CRT mono	
	M1IP	485		CRT mono	
	M1A1	4327		CRT mono	
	M1A2	392	5586	CRT mono	
57.15 x 57.15 (2.25 x 2.25)	C-9A	20		EM	
	C-9B	29		EM	
	C-9C	3		EM	
	C-130H	560		AMLCD	
	KC-135E	300		AMLCD color	
	KC-135R	680		AMLCD color	
	KC-135T	108		AMLCD color	
	T-6A	8532	10232	AMLCD color	
71.25 x 30.48 (2.80 x 1.20)	ISHMRS	5041	5041	AMLCD mono.	
90.00 x 170.00 (3.54 x 6.69)	RAH-66	5200	5200	CRT color	
100.58 x 100.58 (3.96 x 3.96)	F-16A/B MLU	1796		AMLCD color	
	F-16C/D follow	1310		AMLCD color	
	T-6A	2844	5950	AMLCD 80:1, color	
127.00 x 127.00 (5.0 x 5.0)	AV-8B	164		CRT	
	F-14A/B		198	CRT	
	F-15A/Bmsip	100		CRT	
	F-15C/D		408	CRT	
	F-15E	890		CRT	
	F/A-18A/B	1473		CRT	
	F/A-18A/Bfms	1119		CRT	
	F/A-18C/D	2202		CRT	
	F/A-18C/Dfms1	518		CRT	
	F/A-18E/F	1334		CRT	
	F-117A	108		CRT	
	M1A2	392		CRT	
	E-2C	156		EM	
	E-3B	92		EM	
	E-3C	36		EM	
	E-4B	8		EM	
	E-8C	39		EM	
	C-130T	40		EM	
	KC-130F	76		EM	
	KC-130R	28		EM	
	KC-130T	40		EM	

This paper was cleared by ASC99-0652 on 2 April 1999

KC-130R	8	EM
CG 58	36	CRT

Table I (continued). Display sizes having aggregate defense applications of five thousand units or greater.

Display Size, mm (in.) H x V	Platform	No.	Total	Current Technology
Diagonal	Diameter			
	CG 69	12	CRT	
	C-9A	20	EM	
	C-9B	29	EM	
	C-9C	3	EM	
	C-12C	21	EM	
	C-12D	6	EM	
	C-20A	12	EM	
	C-20J	4	10584	EM
147.32 x 228.60 (5.8 x 9.0)	DACT	7000	7000	AMLCD color
152.40 (6.0)	SHTU	6168	6168	LCD mono
158.75 x 158.75 (6.25 x 6.25)	F/A-18E/F	667	CRT	
	F-22A	1056	AMLCD	
	CV-22	200	AMLCD	
	HV-22	192	AMLCD	
	MV-22	1640	AMLCD	
		60	CRT	
	AH-64D	928	LCD	
	C-17A	480	CRT	
	C-18E	2	CRT	
	T-43A	1	5226	CRT
200.00 x 150.00 (7.87 x 5.91)	RAH-66	5200	5200	CRT
203.20 (8.0)	JSF	8934	AMLCD color	
	JAST 75/25	30	AMLCD color	
	HH-60G	172	CRT mono	
	MH-60G	28	CRT mono	
	SSN-688MkI	76	CRT color?	
	SSN-688MkII	18	CRT color?	
	SSN-688BSY	42	CRT color?	
	NSSN	6	CRT color?	
	SSN-21	6	CRT color?	
	CH-53E	282	CRT mono	
	CV 67	3	9597	CRT color
238.76 (9.4)	M7 FIST	312	CRT	
	V1 LCU	616	dLCD mono	
	V1A1 LCU	888	AMLCD color	
	V2 LCU	4965	dLCD mono	
	V2A1 LCU	4461	AMLCD color	
	Litton-3486	300	11542	AMLCD mono
307.34 (12.1)	Crusader 3200		AMLCD color	
	M88A2	90	AMLCD color	

This paper was cleared by ASC99-0652 on 2 April 1999

Grizzly	1688	AMLCD color
M109	58	AMLCD

Table I (continued). Display sizes having aggregate defense applications of five thousand units or greater.

Display Size, mm (in.) H x V	Platform	No.	Total	Current Technology
Diagonal	Diameter			
	M109 FMS	51		AMLCD
	ACE SS-5	120		AMLCD color
	ACE SS-Ultra	4		AMLCD color
	SH-60R	1250		AMLCD
	CH-60	600	7061	AMLCD
330.20 (13.0)	SSN-21	9		CRT mono?
	SSN-21	39		Plasma mono
	SSN-21	3		AMLCD color?
	EP-3E	12		AMLCD color
	CVN 65	915		CRT color/mono
	CVN 74	2177		CRT color/mono
	CG 58	1080		CRT color/mono
	CG 58	48		AMLCD color
	DD 979	716		CRT color
	FFG 45	408		CRT color
	CV 67	42		CRT
	DDG 64	36		CRT
	CG 69	204		CRT
	LHD 3	126		CRT
	LHA 4	40		CRT
	LPD 15	33		CRT
	LSD 44	8		CRT
	ARS 51	8	5904	CRT
355.60 (14.0)	AC-130H	32		CRTcolor, mono
	SSN-688	304		CRTmono?
	SSBN MkII	80		CRTmono
	HC-130N	20		CRTcolor?
	HC-130(H)N	20		CRTcolor?
	HC-130P	42		CRTcolor?
	MC-130P	56		CRTcolor?
	SSBN-726	80		CRTmono
	ES-3A	48		CRTcolor
	P-3C	2		CRT
	CVN 65	11		CRT
	CVN 74	3794		CRTcolor
	CG 58	720		CRTcolor
	CG 58	24		AMLCDcolor
	DD 979	432		CRTcolor
	FFG 45	612		CRTcolor, mono
	MC-130E	28		CRTmono?
	CV 67	183		CRT
	CG 69	672		CRT
	LPD 15	110		CRT
	ARS 51	4	7226	CRT

This paper was cleared by ASC99-0652 on 2 April 1999

Table I (concluded). Display sizes having aggregate defense applications of five thousand units or greater.

Display Size, mm (in.) H x V	Platform	No.	Total	Current Technology
Diagonal	Diameter			
482.60 (19.0)	C2V	318		CRT color?
	SSN-688MkI	76		CRT color?
	SSN-688MkII	54		CRT color?
	SSN-688BSY	42		CRT color?
	SSBN-726MkII		50	CRT mono?
	NSSN	115		CRT color
	SSN-21	84		CRT
	DDG-51	481		CRT color?
	EC-130E	96		CRT color
	P-3C UIIVPU	7		CRT color?
	P-3C UIVPU	7		CRT color?
	P-3C UIIIAIP	30		CRT color?
	P-3C UIIIRAIP		30	CRT color?
	CVN 65	455		CRT color
	CVN 74	1744		CRT color
	CG 58	504		CRT color
	DD 979	120		CRT color
	FFG 45	204		CRT color
	C-26A, fms	13		CRT color
	TCU	2541		CRT color
	TCU, fms	142		CRT color
	CV 67	76		CRT
	CG 69	284		CRT
	LHA 4	15		CRT
	LPD 15	11		CRT
	LSD 44	16		CRT
	LSD 51	8		CRT
	ARS 51	4	7527	CRT

Table II. Sampling of display sizes having current DoD applications across 10 or more programs (< 5000 units each).

Display Size, mm (in.)	Platform (Number, Current Technology)
66.68 x 53.98 (2.625 x 2.13):	CVN 65 (1, LED), CVN 74 (7, LED), CG 58 (24, CRT), DDG 64 (36, LED), CG 69 (12, CRT), LHD 3 (7, CRT), LHA 4 (5, CRT), LSD 44 (16, CRT), LSD 51 (8, CRT), ARS 51 (4, CRT); Total = 120
69.85 diameter (2.75):	F/A-18A/B (409, CRT), F/A-18A/B fms (305, CRT), F/A-18C/D (612, CRT), F/A-18C/D fms (406, CRT),

This paper was cleared by ASC99-0652 on 2 April 1999

F/A-18E/F (548, CRT), CH-46E (243, CRT),
HH-60G (86, CRT), MH-60G (14, CRT), ARS 51 (4, CRT),
TH-57C (73, EM); **Total = 2700**

Table II (continued). Sampling of display sizes having current DoD applications across 10 or more programs (< 5000 units each).

101.60 x 69.85 (4.0 x 2.75):	KC-135E (450, CRT), C-135B (8, CRT), C-135C (4, CRT), C-135E (6, CRT), KC-135R (1020, CRT), KC-135T (162, CRT), NKC-135E (6, CRT), OC-135B (6, CRT), WC-135B, (8, CRT), WC-135W (6, CRT); Total = 1676
101.60 x 76.20 (4.0 x 3.0):	F-14A/B (198, EM), E-9A (2, CRT), DD 979 (24, CRT), FFG 45 (51, CRT), C-12F (2, CRT), C-12J (7, CRT), C-20B (25, CRT), C-20D (10, CRT), C-20E (8, CRT), C-26A,fms (13, LED), C-26B (21, LED), C-26D (7, LED), RC-12F (2, CRT), UC-12F (10, CRT), CV 67 (1, CRT), DDG 64 (36, CRT), CG 69 (12, CRT), LHA 4 (5, EL), LPD 15 (11, CRT), LSD 44 (8, CRT), LSD 51 (4, CRT), PC 11 (13, Plasma); Total = 471
101.60 x 101.60 (4.0 x 4.0):	F-15C/D (463, CRT), F-16C/D (2996, CRT), DC-130A (6, EM), C-12F (8, EM), C-12J (28, EM), C-22B (6, EM), UV-18 (2, CRT), CH-46E (486, AMLCD), A-10A (235, CRT), LSD 44 (32, Plasma), LSD 51(4, Plasma); Total = 4266
107.19 x 107.19 (4.22 x 4.22):	C-12 F1 (48, AMLCD), C-12 F2 (32, AMLCD), C-12 F3 (252, AMLCD), C-135B (4, AMLCD), C-135C (8, AMLCD), C-135E (12, AMLCD), OC-135B (10, AMLCD), WC-135B (4, AMLCD), WC-135W (10, AMLCD), KC-135E (750, AMLCD), KC-135R (1700, AMLCD), KC-135T (220, AMLCD), NKC-135E (10, AMLCD), MH-47D (44, AMLCD), MH-60L (144, AMLCD); Total = 3248
107.95 x 82.55 (4.25 x 3.25):	CVN 65 (1, CRT), CVN 74 (7, CRT), CG 58 (168, CRT), DD 979 (144, CRT), FFG 45 (306, CRT), CV 67 (2, CRT), DDG 64 (216, CRT), CG 69 (96, CRT), LPD 15 (66, CRT), AS 39 (12, CRT), E-6B (30, CRT); Total = 1048
114.30 x 88.90 (4.5 x 3.5):	F/A-18C/D (612, dLCD), F/A-18C/Dfms (406, dLCD), F/A-18E/F (667, CRT), E-9A (2, CRT), CV-22 (50, AMLCD), HV-22 (48, AMLCD), MV-22 (425, AMLCD), KC-130T (32, CRT), C-130H (199, LCD), CV 67 (1, dLCD); Total = 2442
120.65 diameter (4.75):	C-130H (334, CRT), EC-135C (16, CRT), EC-135E (8, CRT), EC-135K (2, CRT), EC-135N (2, CRT), NKC-135E (2, CRT), OC-135B (6, CRT), RC-135S (6,CRT), RC-135U (6,CRT), RC-135V (24, CRT), RC-135W (18, CRT), RC-135X(3,CRT),TC-135S (2,CRT),TC-135W (2,CRT); Total=431
127.00 x 107.95 (5.0 x 4.25):	AH-64A (1516, EM), E-8C (26, EM),, C-130T (40, EM), C-137B (4, EM), C-137C (8, EM), KC-130F (76, EM), KC-130R (28, EM), KC-130T (40, EM), LC-130R (8, EM), T-43A (12, EM); Total = 1758

Table II (concluded). Display sizes having current DoD applications across 10 or more programs (< 5000 units each).

127.00 x 133.35 (5.0 x 5.25):	CT-43A (2, EM), AT-38B (146, EM), EC-130E (30, EM), EC-130H (30, EM), WC-130H (20, EM), HC-130H (2, EM), A-10A (235, EM), OA-10A (140, EM), HH-1N (50, EM), HH-60G (172, EM), MH-60G (28, EM), C-137B (4, EM), C-137C (8, EM), CH-47D (262, EM), UH-60A (1788, EM), UH-60L (948, EM), UH-60Q (8, EM), EH-60A (120, EM), EH-60L (12, EM), MH-60A (24, EM), UH-3H (108, EM), VH-3A (8, EM); Total = 4145
228.60 diagonal (9.0):	AC-130H (27, CRT), F-14A/B (198, CRT), F-14D (51, CRT), C2V (106, TFEI), MH-53J (82, AMLCD), SH-60F (154, CRT), HH-60G (17, CRT), HH-60H (40, CRT), HH-60J (42, CRT), UH-1N (100, CRT), LCAC (180, CRT), HC-130N (10, CRT), HC-130(H)N (10, CRT), HC-130P (21, CRT), MC-130P (28, CRT), CVN 65 (11, CRT), CVN 74 (77, CRT), CV 67 (1, CRT), LPD 15 (22, CRT), DD 979 (48, CRT), FFG 45 (102, CRT), MC-130E (28, CRT), SSN-688MkI (38, CRT), SSN-21 (3, CRT), SSN-688MkII (9, CRT), SSN-688BSY (21, CRT), NSSN (3, CRT), EP-3E (36, CRT), P-3C (638, CRT); Total = 2089
264.16 diagonal (10.4):	V2A2 LCU (1684, AMLCD), P-3C (287, AMLCD), PPWS (2, AMLCD), Talon FRPRW (17, AMLCD), Galaxy 1100 (134, AMLCD), PEN 10 (1200, AMLCD), PEN 10 FMS (24, AMLCD), 486LT FMS (400, AMLCD), PC Mobile (5, AMLCD), CDA (5, AMLCD); Total = 3758
336.55 diagonal (13.25):	DD 979 (408, CRT), FFG 45 (459, CRT), CV 67 (7, CRT), DDG 64 (216, CRT), LHD 3 (238, CRT), LHA 4 (25, CRT), LPD 15 (572, CRT), LSD 44 (8, CRT), ARS 51 (16, CRT), AS 39 (202, CRT); Total = 2151
342.90 diagonal (13.5):	EC-130E (15, CRT), LCAC (90, CRT), CG 58 (48, CRT), DD 979 (240, CRT), FFG 45 (357, CRT), CV 67 (16, CRT), DDG 64 (792, CRT), CG 69 (24, CRT), LHD 3 (49, CRT), LHA 4 (15, CRT), LPD 15 (22, CRT), LSD 44 (24, CRT), LSD 51 (12, CRT), ARS 51 (8, CRT); Total = 1712
349.25 diagonal (13.75)	CG 58 (72, CRT), CG 69 (24, CRT), DD 979 (24, CRT), FFG 45 (153, CRT), CV 67 (36, CRT), DDG 64 (648, CRT), LHD 3 (854, CRT), LHA 4 (15, CRT), LPD 15 (22, CRT), LSD 44 (8, CRT), ARS 51 (4, CRT), AS 39 (100, CRT); Total = 1960
406.40 diagonal (16.0)	CVN 65 (4, CRT), CG 58 (288, CRT), FFG 45 (204, CRT), CV 67 (73, CRT), LHD 3 (7, CRT), LHA 4 (10, CRT), LSD 44 (24, CRT), LSD 51 (4, CRT), ARS 51 (16, CRT), PC 11 (52, CRT); Total = 682
431.80 diagonal (17.0):	SSN-688MkI (152, CRT), SSBN-726MkI (16, CRT), SSBN-726MkII (60, CRT), NSSN (24, CRT), SSN-21 (3, CRT), EP-3E (36, CRT), CVN 65 (343, CRT), CVN 74 (203, CRT), CG 58 (233, CRT), CG 69 (12, CRT), DDG-51 (720, CRT), DDG-51 (96, Plasma); Total = 1898

Table III. Example of display size clustering about a key center point (10 in. diagonal). Range: 9.5-10.5 in. (or 7.5 – 8.5 in. by 5.5 – 6.5 in., and *vice versa*).

Size, mm (in.)	No.	Total	Technology	266.70 diagonal (10.5)	
241.30 diagonal (9.1)				DD 979	48
SH-60B	266		CRT	CV 67	1
GETAC N	135		LCD	CG 69	24
GETAC N, fms	15		LCD	LHD 3	7
GETAC NX,fms	50		LCD	LHA 4	5
GETAC I	70		LCD	LPD 15	11
GETAC IX	37		LCD	ARS 51	4
CDA	592		AMLCD		100
LHD 3	7		dLCD		AMLCD
LHA 4	10	1182	AMLCD		
243.84 diagonal (9.6)				190.50 x 139.70 (7.5 x 5.5)	
M58	170	170	LCD	MH-53J	164
247.65 diagonal (9.75)				DD 979	164
LPD 15	22	22	CRT	264	264
254.00 diagonal (10.0)					CRT
YAL-1A14			AMLCD?	190.50 x 146.05 (7.5 x 5.75)	
CG 58	12		CRT	CVN 65	2
CG 69	12		CRT	CVN 74	7
LHA 4	10	48	CRT	CG 58	57
259.08 diagonal (10.2)					CRT
P-3C	55	55	Plasma	192.00 x 144.00 (7.56 x 5.72)	
260.35 diagonal (10.25)				RTU-E	505
CG 69	72	72	AMLCD	RTU-E, fms	707
263.53 diagonal (10.38)					AMLCD
FFG 45	51	51	CRT		
264.16 diagonal (10.4)				192.02 x 144.02 (7.56 x 5.67)	
V2A2 LCU	1684		AMLCD	Humvee	300
P-3C	287		AMLCD	Litton-1486	1100
PPWS	2		AMLCD		1400
Talon FRPRW	17		AMLCD		AMLCD
Galaxy 1100	134		AMLCD		
PEN 10	1200		AMLCD	193.68 x 139.70 (7.625 x 5.5)	
PEN 10, fms	24		AMLCD	F-117A	54
486LT, fms	400		AMLCD	P-3C	222
PC Mobile	5		AMLCD		CRT
CDA	5	3758	AMLCD	193.68 x 142.88 (7.625 x 5.625)	
				LHA 4	15
					15
					CRT
				193.68 x 146.05 (7.625 x 5.75)	
				DDG 64	157
				PC 11	170
					CRT
				193.80 x 143.00 (7.63 x 5.63)	
				FFG 45	357
					357
					CRT
				195.07 x 145.03 (7.68 x 5.71)	
				C-130H	119
					119
					CRT
				195.26 x 146.05 (7.69 x 5.75)	
				CG 58	12
				CG 69	24
					LCD
					LCD

Table III (concluded). Example of display size clustering about a key center point (10 in. diagonal).
 Range: 9.5-10.5 in.
 (or 7.5 – 8.5 in. by 5.5 – 6.5 in., and *vice versa*).

Size, mm (in.) System	No.	Total	Technology	211.20 x 158.40 (8.31 x 6.24)			
196.00 x 147.60 (7.72 x 5.81)				RLT 410C 224	44	AMLCD	
RLT 410C	224		LCD	RLT 410C,fms 90	18	AMLCD	
RLT 410C,fms	90		LCD				
RLT 410D	49		LCD				
RLT 410F	126		LCD				
RLT 410D/F	70		LCD				
PIDS	115	674	LCD				
196.85 x 146.05 (7.75 x 5.75)				212.73 x 158.75 (8.375 x 6.25)			
DD 979	24	24	LCD	CV 67	1	Plasma	
196.85 x 149.23 (7.75 x 5.88)				214.31 x 160.34 (8.4375 x 6.3125)			
CVN 74	7	7	AMLCD	LHA 4	25	Plasma	
200.00 x 150.00 (7.87 x 5.91)				215.90 x 158.75 (8.5 x 6.25)			
RAH-66	5200	5200	CRT	CVN 65	2	LCD	
203.20 x 152.40 (8.0 x 6.0)				CVN 65	2	LCD	
MLRS	679		EL	CVN 65	2	LCD	
MLRS, fms	172		EL	CVN 65	2	LCD	
B-1B	564		CRT	CVN 65	2	LCD	
B-52H	658		CRT	CVN 65	2	LCD	
CV-22	50		AMLCD	CVN 65	2	LCD	
HV-22	48		AMLCD	CVN 65	2	LCD	
MV-22	425		AMLCD	CVN 65	2	LCD	
C-130J	2		AMLCD	CVN 65	2	LCD	
UH-60Q	8	2606	AMLCD	CVN 65	2	LCD	
209.55 x 157.16 (8.25 x 6.1875)				144.78 x 210.82 (5.7 x 8.3)			
LHA 4	5	5	dLCD	EC-130E	45	CRT	
209.55 x 158.75 (8.25 x 6.25)				WC-130H	30	CRT	
CVN 74	49		EL	C-130E	735	CRT	
DD 979	24	73	LCD	C-130H	840	1650	CRT
210.82 x 157.48 (8.3 x 6.2)				146.05 x 195.26 (5.75 x 7.6875)			
M1A2 SEP	792		AMLCD	LHD 3	7	CRT	
Wolverine	465		AMLCD	149.23 x 196.85 (5.875 x 7.75)			
M2A3/M3A3	2218	3485	LCD	LHA 4	5	CRT	
211.14 x 158.75 (8.31 x 6.25)				149.23 x 200.03 (5.875 x 7.875)			
DDG 64	36	36	AMLCD	C-141C	252	AMLCD	
211.14 x 160.34 (8.31 x 6.31)				151.64 x 196.60 (5.97 x 7.74)			
CVN 65	3		AMLCD	EA-6B	250	CRT	
CVN 74	42	45	AMLCD	152.40 x 203.20 (6.0 x 8.0)			
				C-130J	24	AMLCD	
				C-130Jfms	148	AMLCD	
				C-141B	400	AMLCD	
				UC-35	33	AMLCD	
				T-38C	850	AMLCD	
				CH-47F	600	2055	AMLCD
				157.48 x 210.82 (6.2 x 8.3)			
				P-3C	20	CRT	

Table IV. Example of display size clustering about a reference point (19.5 in. diagonal). Range: 17-22 in.

Size, mm (in.)	No.	Total	Technology	476.25 diagonal (18.75)		
System				CG 58	24	CRT
				CV 67	2	CRT
				LHA 4	25	CRT
				LPD 15	22	69
						CRT
431.80 diagonal (17.0)				479.43 diagonal (18.875)		
SSN-688MkI	152		CRT	LHA 4	5	5
SSBN-726MkI	16		CRT			CRT
SSBN-726MkI	60		CRT?	482.60 diagonal (19.0)		
NSSN	24		CRT	C2V	318	CRT
SSN-21	3		CRT	SSN-688MkI	76	CRT
EP-3E	36		CRT	SSN-688MkII	54	CRT
CVN 65	343		CRT	SSN-688BSY	42	CRT
CVN 74	203		CRT	SSBN-726MkII	50	CRT
CG 58	233		CRT	NSSN	115	CRT
CG 69	12		CRT	SSN-21	84	CRT
DDG-51	720		CRT	DDG-51	481	CRT
DDG-51	96	1898	Plasma	EC-130E	96	CRT
438.15 diagonal (17.25)				P-3C UIIVPU	7	CRT
CV 67	1	1	CRT	P-3C UIVPU	7	CRT
				P-3C UIIIAIP	30	CRT
444.50 diagonal (17.5)				P-3C UIIRAIPIP	30	CRT
CV 67	3	3	CRT	CVN 65	455	CRT
				CVN 74	1744	CRT
				CG 58	504	CRT
457.20 diagonal (18.0)				DD 979	120	CRT
CVN 65	1		CRT	FFG 45	204	CRT
				C-26A, fms	13	CRT
461.96 diagonal (18.1875)				TCU	2541	CRT
LHD 3	7	7	CRT	TCU, fms	142	CRT
				CV 67	76	CRT
463.55 diagonal (18.25)				CG 69	284	CRT
DD 979	24		CRT	LHA 4	15	CRT
CG 69	12		CRT	LPD 15	11	CRT
LSD 44	40		CRT	LSD 44	16	CRT
LHA 4	5	81	CRT	LSD 51	8	CRT
				ARS 51	4	7527
						CRT
465.14 diagonal (18.3125)				484.19 diagonal (19.0625)		
LHA 4	5	5	CRT	LHD 3	49	CRT
466.73 diagonal (18.375)				LHA 4	10	59
PC 11	39		CRT			CRT
AS 39	2	41	CRT	485.78 diagonal (19.125)		
469.90 diagonal (18.5)				LHD 3	28	CRT
C-26B	10		CRT	LHA 4	100	CRT
UC-26C	1		CRT	LSD 44	8	CRT
LHA 4	5	16	CRT	LSD 51	4	140
						CRT
473.08 diagonal (18.625)				487.36 diagonal (19.1875)		
LHD 3	35		CRT	CV 67	1	CRT
LHA 4	5	40	CRT	CG 69	12	CRT
				LHA 4	5	18
						CRT

Table IV (concluded). Example of display size clustering about a reference point (19.5 in. diagonal).
Range: 17-22 in.

Size, mm (in.)	No.	Total	Technology	508.00 diagonal (20.0)	
CV 67	11		CRT	CVN 65	26
LHD 3	154		CRT	CVN 74	4326
LHA 4	45		CRT	CG 58	96
LPD 15	22		CRT	DDG 64	36
LSD 44	24		CRT	CG 69	108
LSD 51	20		CRT	LHD 3	56
ARS 51	8	284	CRT	LHA 4	20
488.95 diagonal (19.25)				LSD 44	16
CV 67	11		CRT	LSD 51	8
LHD 3	154		CRT		4692
LHA 4	45		CRT		CRT
LPD 15	22		CRT	511.18 diagonal (20.125)	
LSD 44	24		CRT	AS 39	4
LSD 51	20		CRT		4
ARS 51	8	284	CRT	512.76 diagonal (20.1875)	
490.64 diagonal (19.31)				LHA 4	5
DDG 64	36		CRT		5
LHD 3	7		CRT	514.35 diagonal (20.25)	
LHA 4	10	53	CRT	CV 67	2
492.13 diagonal (19.375)				LHD 3	7
DDG 64	36		CRT		9
LHD 3	238		CRT	517.53 diagonal (20.375)	
LHA 4	40	314	CRT	LHA 4	5
493.71 diagonal (19.4375)					5
LHA 4	5	5	CRT	520.70 diagonal (20.5)	
495.30 diagonal (19.50)				DD 979	24
CV 67	10		CRT		24
LHD 3	7		CRT	523.88 diagonal (20.625)	
LSD 44	8		CRT	LHA 4	5
LSD 51	4	29	CRT		5
498.48 diagonal (19.625)				527.05 diagonal (20.75)	
CV 67	3	3	CRT	DD 979	24
500.06 diagonal (19.69)				LHD 3	7
DDG 64	36	36	CRT		31
501.65 diagonal (19.75)				533.40 diagonal (21.0)	
CV 67	15		CRT	Cmdr TOC	15
LHD 3	7		CRT	CVN 65	13
LHA 4	5		CRT	CVN 74	35
LPD 15	11	38	CRT	CG 58	24
504.83 diagonal (19.875)				DD 979	48
ARS 51	4	4	CRT	YAL-1A28	163
506.41 diagonal (19.9375)					AMLCD
LHA 4	5	5	CRT	558.80 diagonal (22.0)	
CV 67	4	4	CRT	CV 67	4
568.33 diagonal (22.375)					4
LHA 4	5	5	CRT	577.85 diagonal (22.75)	
CV 67	2	2	CRT	CV 67	2
584.20 diagonal (23.0)					2
CVN 74	28	28	CRT	CRT	

Table V. Display sizes unique to a given system (platform/program) one or more in quantity.

Display Size, H x V mm (in) (unless otherwise noted)	Platform	No.	Technology	762.00 diagonal (30.0)	NSSN	6	CRT
63.50 diameter (2.499)	AV-8B	145	CRT	1295.4 x 1295.4 (51.0 x 51.0)	SSBN-726MkII	10	EL
106.68 x 55.88 (4.2 x 2.2)	EA-6B	250	CRT	121.92 x 236.22 (4.8 x 9.3)	B-52H	188	LED
146.05 diameter (5.75)	EA-6B	125	CRT	134.62 x 236.22 (5.3 x 9.3)	B-52H	94	LED
151.64 diameter (5.97)	EA-6B	125	CRT	190.50 x 139.70 (7.5 x 5.5)	MH-53J	164	CRT
151.64 x 196.60 (5.97 x 7.74)	EA-6B	250	CRT	98.43 diameter (3.875)	AH-1F	944	EM
101.60 x 127.00 (4.0 x 5.0)	F-14A/B	396	EM	88.90 x 66.68 (3.50 x 2.625)	CH-46E	486	CRT
71.12 diagonal (2.8)	F-14D	51	CRT	146.05 x 48.26 (5.75 x 1.9)	CH-46E	243	EM
127.00 x 177.80 (5.0 x 7.0)	F-14D	51	CRT	92.71 x 45.72 (3.65 x 1.8)	CH-47D	131	dLCD
133.35 x 136.65 (5.25 x 5.38)	F-14D	153	CRT	107.19 x 106.68 (4.22 x 4.20)	CH-47F	1200	AMLCD
187.20 x 225.81 (7.37 x 8.89)	F-15A/B	100	CRT	71.12 x 50.80 (2.8 x 2.0)	MH-53E	44	CRT
103.89 diameter (4.09)	F-15C/D	408	CRT	83.82 x 72.39 (3.30 x 2.85)	OH-58D	406	dLCD
76.20 x 88.90 (3.0 x 3.5)	F-15E	184	CRT	162.56 x 121.92 (6.4 x 4.8)	OH-58D	812	CRT
61.59 diagonal (2.425)	F-16C/D	1498	CRT	90.00 x 170.00 (3.54 x 6.69)	RAH-66	5200	CRT
62.48 diagonal (2.46)	F-16C/D	363	CRT	200.00 x 150.00 (7.87 x 5.91)	RAH-66	5200	CRT
77.98 diameter (3.07)	F-16C/D	941	CRT	125.73 x 99.06 (4.95 x 3.9)	F/A-18E/F	667	CRT
				69.85 x 57.15 (2.75 x 2.25)	TH-57B	47	EM
33.02 x 22.86 (1.3 x 0.9)	F-22	704	CRT	69.85 x 76.20 (2.75 x 3.0)	TH-57C	73	EM
70.51 x 58.01 (2.776 x 2.284)	F-22	352	CRT	88.90 x 82.55 (3.5 x 3.25)	TH-57C	146	EM
99.06 x 73.66 (3.9 x 2.9)	F-22	704	AMLCD	33.34 diameter (1.3125)	UH-1N	200	CRT
198.12 x 198.12 (7.8 x 7.8)	F-22	352	AMLCD	63.50 diagonal (2.499)	UH-1N	100	CRT
40.00 diameter (1.575)	M2A3/M3A3	2218	CRT	127.25 x 133.60 (5.01 x 5.26)	UH-1N	130	EM
41.15 x 23.11 (1.62 x 0.91)	M1A2SEP	1584	CRT	52.39 x 12.70 (2.0625 x 0.5)	UH-3H	54	LED
				71.44 x 93.38 (2.8125 x 0.875)	UH-3H	54	dLCD
87.63 x 36.07 (3.45 x 1.42)	M2A2ODS	1570	LED	86.36 x 139.70 (3.4 x 5.5)	E-2C	234	CRT
243.84 diagonal (9.6)	M58	170	LCD	269.24 x 269.24 (10.6 x 10.6)	E-2C	126	CRT
				317.50 x 254.00 (12.5 x 10.0)	E-2C	108	AMLCD
185.42 x 139.70 (7.3 x 5.5)	LAV	34	CRT	129.54 x 129.54 (5.1 x 5.1)	E-4B	8	EM
254.00 x 203.20 (10.0 x 8.0)	AAAV	3081	AMLCD	355.60 x 355.60 (14.0 x 14.0)	E-4B	16	Plasma
147.32 x 228.60 (5.8 x 9.0)	DACT	7000	AMLCD	80.66 x 66.68 (3.1875 x 2.625)	E-6B	45	CRT
				187.33 x 141.29 (7.375 x 5.56)	E-6B	15	CRT
223.96 x 97.96 (8.82 x 3.86)	RLT 88	215	LCD	327.03 x 244.48 (12.875x9.68)	E-6B	30	CRT
152.40 diagonal (6.0)	SHTU	6168	LCD	203.20 x 83.82 (8.0 x 3.3)	E-8A	40	dLCD
				66.80 x 9.53 (2.63 x 0.375)	E-8C	85	CRT
101.60 x 38.10 (4.0 x 1.5)	RF-5022	3309	AMLCD	69.85 x 53.98 (2.75 x 2.125)	E-8C	85	CRT
				146.05 x 38.10 (5.75 x 1.50)	E-8C	65	LCD
71.25 x 30.48 (2.80 x 1.20)	ISHMRS	041	AMLCD	158.75 x 172.21 (6.25 x 6.78)	E-8C	26	CRT
				514.35 x 400.05 (20.25x15.75)	E-8C	234	CRT
327.66 diagonal (12.9)	ACE SS-20	32	AMLCD	38.10 x 20.64 (1.5 x 0.81)	E-9A	12	LED
				44.45 x 11.11 (1.75 x 0.44)	E-9A	4	LED
408.94 diagonal (16.1)	SPARCstation	94	AMLCD	57.15 x 44.45 (2.25 x 1.75)	E-9A	2	CRT
				84.66 x 38.10 (3.33 x 1.5)	E-9A	2	CRT
198.12 diagonal (7.8)	HTU	3000	LCD	158.75 x 82.55 (6.25 x 3.25)	E-9A	2	LCD
				190.50 diagonal (7.5)	E-9A	4	CRT

234.95 x 190.50 (9.25 x 7.5)	E-9A	2	CRT	209.55 x 107.95 (8.25 x 4.25)	CVN 74	7	EL
259.08 x 194.56 (10.2 x 7.66)	E-9A	2	CRT	282.58 x 207.96 (11.13 x 8.19)	CVN 74	7	CRT
Table V (continued). Display sizes unique to a given system (platform/program), one or more in quantity.							
Size, H x V mm (in) (unless otherwise noted)	Platform	No.	Technology				
95.25 x 190.50 (3.75 x 7.5)	P-3C	60	EL	288.92 x 95.25 (11.38 x 3.75)	CVN 74	14	LED
101.60 diameter (4.0)	P-3C	236	CRT	387.35 x 288.93 (15.25 x 11.375)	CVN 74	7	CRT
101.60 x 152.40 (4.0 x 6.0)	P-3C	999	Plasma	407.99 x 300.04 (16.06 x 11.81)	CVN 74	7	CRT
101.60 x 171.45 (4.0 x 6.75)	P-3C	3	Plasma	492.13 x 368.30 (19.38 x 14.5)	CVN 74	14	CRT
104.14 x 104.14 (4.1 x 4.1)	P-3C	985	AMLCD	584.20 diagonal (23.0)	CVN 74	28	CRT
139.70 x 139.70 (5.5 x 5.5)	P-3C	368	CRT	601.98 x 441.96 (23.7 x 17.4)	CVN 74	7	CRT
157.48 x 210.82 (6.2 x 8.3)	P-3C	20	CRT	1041.40 x 635.00 (41.0 x 25.0)	CVN 74	7	Plasma
182.88 X 137.16 (7.2 X 5.4)	P-3C	35	CRT	1092.2 x 1092.2 (43.0 x 43.0)	CVN 74	14	CRT / LCD
228.60 diameter (9.0)	P-3C	632	CRT	601.98 x 441.96 (23.7 x 17.4)	CVN 74	7	dLCD
259.08 diagonal (10.2)	P-3C	55	Plasma	57.15 x 12.70 (2.25 x 0.5)	CV 67	1	CRT?
360.68 diagonal (14.2)	P-3C	35	AMLCD	63.50 x 53.975 (2.5 x 2.125)	CV 67	2	CRT
406.40 diameter (16.0)	P-3C	650	CRT	63.50 x 54.10 (2.5 x 2.13)	CV 67	2	CRT
114.30 x 152.40 (4.5 x 6.0)	S-3B	119	CRT	76.20 x 44.45 (3.0 x 1.75)	CV 67	1	dLCD
120.65 x 158.75 (4.75 x 6.25)	S-3B	119	CRT	79.38 x 12.70 (3.125 x 0.5)	CV 67	1	LED
163.83 x 236.22 (6.45 x 9.3)	S-3B	119	CRT	79.38 x 14.29 (3.13 x 0.56)	CV 67	2	dLCD
177.80 x 241.30 (7.0 x 9.5)	S-3B	119	CRT	80.96 x 63.50 (3.1875 x 2.5)	CV 67	1	dLCD
285.75 x 222.25 (11.25 x 8.75)	S-3B	119	CRT	92.25 x 76.20 (3.75 x 3.0)	CV 67	1	LED
368.30 x 279.40 (14.5 x 11.0)	S-3B	238	CRT	95.25 x 25.40 (3.75 x 1.0)	CV 67	2	LED
				100.01 x 77.79 (3.94 x 3.06)	CV 67	3	dLCD
				104.78 x 200.15 (4.125 x 7.88)	CV 67	3	EL
134.62 x 124.46 (5.3 x 4.9)	VC-25A	12	CRT	106.36 x 82.55 (4.19 x 3.25)	CV 67	1	CRT
120.65 x 158.75 (4.75 x 6.25)	S-3B	119	CRT	114.30 x 17.46 (4.5 x 0.69)	CV 67	1	LED
163.83 x 236.22 (6.45 x 9.3)	S-3B	119	CRT	131.36 x 101.60 (5.1875 x 4.0)	CV 67	2	CRT
177.80 x 241.30 (7.0 x 9.5)	S-3B	119	CRT	133.35 diagonal (5.25)	CV 67	6	CRT
285.75 x 222.25 (11.25 x 8.75)	S-3B	119	CRT	136.53 x 30.16 (5.38 x 1.19)	CV 67	1	LED
368.30 x 279.40 (14.5 x 11.0)	S-3B	238	CRT	146.05 x 112.71 (5.75 x 4.44)	CV 67	1	CRT
				177.80 x 133.35 (7.0 x 5.25)	CV 67	4	CRT
98.43 x 73.03 (3.875 x 2.875)	CVN 65	1	CRT	177.80 x 139.70 (7.0 x 5.5)	CV 67	2	CRT
130.18 x 123.83 (5.125x4.875)	CVN 65	2	CRT	180.98 x 136.53 (7.125x5.375)	CV 67	2	CRT
215.90 x 158.75. (8.5 x 6.25)	CVN 65	2	LCD	185.74 x 30.16 (7.31 x 1.19)	CV 67	1	LED
241.30 x 184.15 (9.5 x 7.25)	CVN 65	1	CRT	193.68 x 120.65 (7.63 x 4.75)	CV 67	1	dLCD
241.30 x 209.55 (9.5 x 8.25)	CVN 65	1	CRT	206.38 x 155.58 (8.13 x 6.13)	CV 67	1	AMLCD
247.65 x 184.15 (9.75 x 7.25)	CVN 65	34	CRT	207.96 x 79.38 (8.19 x 3.13)	CV 67	2	Plasma
254.00 x 69.85 (10.0 x 2.75)	CVN 65	1	LCD	212.73 x 158.75 (8.375 x 6.25)	CV 67	1	Plasma
279.40 x 368.30 (11.0 x 14.5)	CVN 65	1	CRT	215.90 x 279.40 (8.5 x 11.0)	CV 67	4	CRT
317.50 x 368.30 (12.5 x 14.5)	CVN 65	12	CRT	219.08 x 171.45 (8.625 x 6.75)	CV 67	3	CRT
330.20 x 254.00 (13.0 x 10.0)	CVN 65	1	CRT	227.01 diagonal (8.9375)	CV 67	1	CRT
381.00 x 304.80 (15.0 x 12.0)	CVN 65	2	CRT	238.13 x 174.63 (9.38 x 6.88)	CV 67	1	CRT
419.10 x 323.85 (16.5 x 12.5)	CVN 65	1	CRT	241.30 x 161.93 (9.5 x 6.375)	CV 67	1	CRT
457.20 x 381.00 (18.0 x 15.0)	CVN 65	2	CRT	244.48 x 158.75 (9.625 x 6.25)	CV 67	1	CRT
463.55 diameter (18.25)	CVN 65	5	CRT	260.35 x 63.50 (10.25 x 2.5)	CV 67	4	Plasma
482.60 x 381.00 (19.0 x 15.0)	CVN 65	1	CRT	273.05 x 374.65 (10.75x14.75)	CV 67	1	CRT?
1066.80 diagonal (42.0)	CVN 65	2	CRT / LCD	285.75 x 228.60 (11.25 x 9.0)	CV 67	4	CRT
				330.20 x 260.35 (13.0 x 10.25)	CV 67	14	CRT
				387.35 diagonal (15.25)	CV 67	1	CRT
				409.58 diagonal (16.125)	CV 67	3	CRT
76.20 x 15.88 (3.0 x 0.625)	CVN 74	14	LED	438.15 diagonal (17.25)	CV 67	1	CRT
82.55 x 19.05 (3.25 x 0.75)	CVN 74	7	LED	444.50 diagonal (17.5)	CV 67	3	CRT
88.90 x 23.81 (3.5 x 0.94)	CVN 74	7	LED	498.48 diagonal (19.625)	CV 67	3	CRT
98.43 x 200.03 (3.88 x 7.88)	CVN 74	7	CRT	558.80 diagonal (22.0)	CV 67	4	CRT
107.95 x 12.7 (4.25 x 0.5)	CVN 74	49	LED	577.85 diagonal (22.75)	CV 67	2	CRT
107.95 x 23.81 (4.25 x 0.94)	CVN 74	7	LED	603.25 diagonal (23.75)	CV 67	1	CRT
107.95 x 84.14 (4.25 x 3.31)	CVN 74	14	CRT	656.80 diagonal (27.0)	CV 67	4	CRT
119.06 x 7.94 (4.69 x 0.31)	CVN 74	42	LED	698.50 diagonal (27.5)	CV 67	1	CRT
131.76 x 19.05 (5.19 x 0.75)	CVN 74	7	LED	1524.00 diagonal (60.0)	CV 67	3	CRT
146.05 x 7.94 (5.75 x 0.31)	CVN 74	42	LED				
158.75 x 22.23 (6.25 x 0.88)	CVN 74	7	LED	50.80 diameter (2.0)	DDG 51	192	CRT
177.80 x 160.34 (7.0 x 6.3125)	CVN 74	21	CRT	177.80 x 228.60 (7.0 x 9.0)	DDG 51	449	CRT
184.15 X 158.75 (7.25 X 6.25)	CVN 74	7	CRT				
196.85 x 149.23 (7.75 x 5.88)	CVN 74	7	AMLCD	38.10 x 15.88 (1.50 x 0.625)	DDG 64	216	LED
203.20 x 279.40 (8.0 x 11.0)	CVN 74	7	CRT	50.80 x 15.88 (2.0 x 0.625)	DDG 64	72	LED
207.96 x 104.78 (8.19 x 4.13)	CVN 74	7	LCD	69.85 x 15.88 (2.75 x 0.625)	DDG 64	144	LED

88.90 x 33.34 (3.50 x 1.31)	DDG 64	36	LED	36.51 x 192.09 (1.44 x 7.56)	DD 979	96	Incandescent
114.30 x 15.88 (4.5 x 0.675)	DDG 64	2448	Plasma	57.15 x 31.75 (2.25 x 1.25)	DD 979	24	CRT
120.65 x 17.46 (4.75 x 0.69)	DDG 64	648		66.68 x 55.56 (2.63 x 2.19)	DD 979	48	CRT
Incandescent				92.08 x 73.03 (3.63 x 2.88)	DD 979	24	CRT
146.05 x 28.58 (5.75 x 1.13)	DDG 64	36	Plasma	114.30 x 76.20 (4.5 x 3.0)	DD 979	24	CRT
Table V (continued). Display sizes unique to a given system (platform/program), one or more in quantity.							
Size, H x V mm (in) (unless otherwise noted)	Platform	No.	Technology	130.00 x 355.60 (5.0 x 14.0)	DD 979	24	CRT
				130.18 x 79.38 (5.125 x 3.13)	DD 979	48	CRT
153.99 x 63.50 (6.06 x 2.50)	DDG 64	252	LED	177.80 x 130.18 (7.0 x 5.13)	DD 979	48	CRT
160.34 x 117.48 (6.31 x 4.63)	DDG 64	72	CRT	190.50 x 144.14 (7.5 x 5.63)	DD 979	264	CRT
168.28 x 127.00 (6.63 x 5.0)	DDG 64	36	AMLCD	196.85 x 146.05 (7.75 x 5.75)	DD 979	24	LCD
201.61 x 34.93 (7.94 x 1.38)	DDG 64	36	Plasma	203.20 x 85.73 (8.0 x 3.18)	DD 979	24	CRT
211.14 x 158.75 (8.31 x 6.25)	DDG 64	36	AMLCD	212.73 x 279.40 (8.38 x 11.0)	DD 979	48	CRT
212.73 x 212.73 (8.38 x 8.38)	DDG 64	432	Plasma	219.08 x 158.75 (8.63 x 6.25)	DD 979	24	AMLCD
222.25 x 119.06 (8.75 x 4.69)	DDG 64	72	Plasma	249.24 x 171.45 (9.81 x 6.75)	DD 979	24	CRT
260.35 x 207.96 (10.25 x 8.19)	DDG 64	36	CRT	254.00 x 209.55 (10.0 x 8.25)	DD 979	24	CRT
269.88 diameter (10.625)	DDG 64	36	CRT	271.46 diagonal (10.6875)	DD 979	24	CRT
271.46 diagonal (10.6875)	DDG 64	36	CRT	317.50 x 269.88 (12.5 x 10.63)	DD 979	72	CRT
277.81 x 206.38 (10.94 x 8.13)	DDG 64	180	CRT	317.50 x 273.05 (12.5 x 10.75)	DD 979	24	CRT
279.40 x 196.85 (11.00 x 7.75)	DDG 64	216	CRT	320.70 diagonal (20.5)	DD 979	24	CRT
282.58 x 352.43 (11.13 x 13.88)	DDG 64	504	CRT	641.35 diagonal (25.25)	DD 979	24	CRT
285.75 x 209.55 (11.25 x 8.25)	DDG 64	36	CRT	654.05 diagonal (25.75)	DD 979	24	CRT
287.34 x 222.25 (11.31 x 8.75)	DDG 64	360	CRT	277.81 x 206.38 (10.94 x 8.13)	DDG 64	180	CRT
323.85 x 234.95 (12.75 x 9.25)	DDG 64	36	CRT	279.40 x 196.85 (11.00 x 7.75)	DDG 64	216	CRT
349.25 x 269.88 (13.75x10.63)	DDG 64	504	CRT	282.58 x 352.43 (11.13 x 13.88)	DDG 64	504	CRT
396.88 x 295.28 (15.63x11.63)	DDG 64	72	CRT	285.75 x 209.55 (11.25 x 8.25)	DDG 64	36	CRT
488.95 x 361.95 (19.25x14.25)	DDG 64	36	CRT	287.34 x 222.25 (11.31 x 8.75)	DDG 64	360	CRT
500.06 diagonal (19.69)	DDG 64	36	CRT	323.85 x 234.95 (12.75 x 9.25)	DDG 64	36	CRT
787.40 diagonal (31.0)	DDG 64	72	CRT	349.25 x 269.88 (13.75x10.63)	DDG 64	504	CRT
819.15 diagonal (32.25)	DDG 64	36	CRT	396.88 x 295.28 (15.63x11.63)	DDG 64	72	Plasma
100.01 x 74.61 (3.94 x 2.94)	CG 58	24	CRT	488.95 x 361.95 (19.25x14.25)	DDG 64	36	LED
125.41 x 104.78 (4.94 x 4.13)	CG 58	24	CRT	500.06 diagonal (19.69)	DDG 64	36	CRT
177.80 x 127.00 (7.0 X 5.0)	CG 58	48	CRT	787.40 diagonal (31.0)	DDG 64	72	CRT
177.80 x 136.53 (7.0 x 5.375)	CG 58	24	CRT	819.15 diagonal (32.25)	DDG 64	36	Plasma
196.85 x 101.60 (7.75 x 4.0)	CG 58	24	Plasma	100.01 x 74.61 (3.94 x 2.94)	CG 58	24	CRT
201.61 x 104.78 (7.94 x 4.13)	CG 58	24	LCD	125.41 x 104.78 (4.94 x 4.13)	CG 58	24	CRT
230.19 diameter (9.0625)	CG 58	48	CRT	177.80 x 127.00 (7.0 X 5.0)	CG 58	48	CRT
239.71 x 176.21 (9.44 x 6.94)	CG 58	24	CRT	177.80 x 136.53 (7.0 x 5.375)	CG 58	24	CRT
242.89 x 179.39 (9.56 x 7.06)	CG 58	144	CRT	196.85 x 101.60 (7.75 x 4.0)	CG 58	24	CRT
257.18 X 212.73 (10.13x8.38)	CG 58	12	CRT	201.61 x 104.78 (7.94 x 4.13)	CG 58	24	CRT
260.35 x 203.20 (10.25 x 8.0)	CG 58	24	CRT	230.19 diameter (9.0625)	CG 58	48	CRT
266.70 diameter (10.5)	CG 58	384	CRT	239.71 x 176.21 (9.44 x 6.94)	CG 58	24	CRT
328.68 x 274.57 (12.94 x 10.81)	CG 58	24	CRT	242.89 x 179.39 (9.56 x 7.06)	CG 58	144	CRT
363.47 X 365.25 (14.31x14.38)	CG 58	24	LCD	257.18 X 212.73 (10.13x8.38)	CG 58	12	CRT
392.11 x 269.88 (15.44x10.63)	CG 58	24	CRT	260.35 x 203.20 (10.25 x 8.0)	CG 58	24	CRT
1371.60 diagonal (54.0)	CG 58	24	CRT	266.70 diameter (10.5)	CG 58	384	CRT
101.60 x 84.14 (4.0 x 3.31)	CG 69	12	CRT	328.68 x 274.57 (12.94 x 10.81)	CG 58	24	CRT
103.19 x 200.03 (4.06 x 7.88)	CG 69	24	Plasma	363.47 X 365.25 (14.31x14.38)	CG 58	24	LED
114.30 x 19.05 (4.5 x 0.75)	CG 69	576	Plasma	392.11 x 269.88 (15.44x10.63)	CG 58	24	dLCD?
133.35 x 292.10 (5.25 x 11.5)	CG 69	12	CRT	1371.60 diagonal (54.0)	CG 58	24	CRT
220.66 diagonal (8.69)	CG 69	12	CRT	101.60 x 84.14 (4.0 x 3.31)	CG 69	12	CRT
254.00 x 204.79 (10.0 x 8.06)	CG 69	168	AMLCD	103.19 x 200.03 (4.06 x 7.88)	CG 69	24	CRT
		48	Plasma	114.30 x 19.05 (4.5 x 0.75)	CG 69	576	Plasma
257.75 x 207.96 (10.13 x 8.19)	CG 69	12	CRT	133.35 x 292.10 (5.25 x 11.5)	CG 69	12	CRT
260.35 diagonal (10.25)	CG 69	72	AMLCD	220.66 diagonal (8.69)	CG 69	12	dLCD
266.70 x 190.50 (10.5 x 7.5)	CG 69	24	CRT	254.00 x 204.79 (10.0 x 8.06)	CG 69	168	CRT
392.11 x 292.10 (15.44x11.50)	CG 69	12	CRT	257.75 x 207.96 (10.13 x 8.19)	CG 69	12	LED
812.80 diagonal (32)	CG 69	12	CRT	260.35 diagonal (10.25)	CG 69	72	dLCD
				266.70 x 190.50 (10.5 x 7.5)	CG 69	24	CRT
				392.11 x 292.10 (15.44x11.50)	CG 69	12	dLCD
				812.80 diagonal (32)	CG 69	12	dLCD

131.76 x 77.79 (5.187 x3.0625)	LHD 3	14	CRT	206.38 x 106.36(8.125x4.1875)	LHA 4	5	Plasma
138.11 x 30.16 (5.4375x1.1875)	LHD 3	168	dLCD	207.96 diagonal (8.1875)	LHA 4	5	CRT
146.05 x 195.26 (5.75x7.6875)	LHD 3	7	CRT	207.96x106.36(8.1875x4.1875)	LHA 4	5	EL
180.98 x 139.70 (7.125 x 5.5)	LHD 3	7	CRT	209.55 x 157.16 (8.25 x 6.1875)	LHA 4	5	dLCD
212.73 diagonal (8.375)	LHD 3	7	CRT	214.31x160.34(8.4375x6.3125)	LHA 4	25	Plasma
225.43 diagonal (8.875)	LHD 3	14	CRT	215.90 x 109.54 (8.5 x 4.3125)	LHA 4	5	Plasma
231.78 x 101.60 (9.125 x 4.0)	LHD 3	7	Plasma	215.90 x 161.93 (8.5 x 6.375)	LHA 4	5	AMLCD
Table V (continued). Display sizes unique to a given system (platform/program), one or more in quantity.							
Size, H x V mm (in) (unless otherwise noted)	Platform	No.	Technology	238.13 diagonal (9.375)	LHA 4	5	AMLCD
247.65 x 106.36 (9.75x4.1875)	LHD 3	14	Plasma	244.48 x 184.15 (9.625 x 7.25)	LHA 4	5	CRT
255.59 x 209.55(10.0625x8.25)	LHD 3	7	CRT	301.63 x 222.25 (11.875x8.75)	LHA 4	70	CRT
276.23 diagonal (10.875)	LHD 3	14	CRT	327.03 diagonal (12.875)	LHA 4	5	CRT
282.58 x 209.55 (11.125x8.25)	LHD 3	14	CRT	327.03x263.53(12.875x10.375)	LHA 4	5	CRT
320.68 diagonal (12.625)	LHD 3	91	CRT	355.60 x 284.16(14.0x11.1875)	LHA 4	25	CRT
331.79 diagonal (13.0625)	LHD 3	7	CRT	366.55 diagonal (13.25)	LHA 4	5	CRT
336.55 x 279.40 (13.25 x 11.0)	LHD 3	147	CRT	390.53x284.16(15.375x11.188	LHA 4	10	CRT
350.84 diagonal (13.8125)	LHD 3	8	CRT	390.53x287.34(15.375x11.313)	LHA 4	15	CRT
374.65 diagonal (14.75)	LHD 3	14	CRT	403.23 diagonal (15.875)	LHA 4	5	CRT
388.94 x 292.10(15.3125x11.5)	LHD 3	14	CRT	404.81 diagonal (15.9375)	LHA 4	810	CRT
390.53 x 296.86(15.3811.688)	LHD 3	14	CRT	407.99 diagonal (16.0625)	LHA 4	10	CRT
461.96 diagonal (18.1875)	LHD 3	7	CRT	415.93 diagonal (16.375)	LHA 4	30	CRT
688.98 diagonal (27.125)	LHD 3	7	CRT	465.14 diagonal (18.3125)	LHA 4	5	CRT
704.85 diagonal (27.75)	LHD 3	14	CRT	479.43 diagonal (18.875)	LHA 4	5	CRT
895.35 diagonal (35.25)	LHD 3	7	CRT	493.71 diagonal (19.4375)	LHA 4	5	CRT
1231.90 diagonal (48.5)	LHD 3	14	CRT			80	Plasma
19.05 x 15.08 (0.75 x 0.59375)	LHA 4	5	LED	506.41diagonal (19.9375)	LHA 4	5	CRT
20.64 x 6.35 (0.8125 x 0.25)	LHA 4	200	LED	512.76 diagonal (20.1875)	LHA 4	5	CRT
22.23 x 12.70 (0.875 x 0.5)	LHA 4	25	LED	517.53 diagonal (20.375)	LHA 4	5	CRT
39.69 x 19.05 (1.5625 x 0.75)	LHA 4	10	LED	927.10 diagonal (36.5)	LHA 4	5	CRT
44.45 x 9.53 (1.75 x 0.375)	LHA 4	20	LED	1282.70 x 1016.00 (50.5 x 40)	LHA 4	5	CRT
47.63 x 15.88 (1.875 x 0.625)	LHA 4	5	LED	1397.00 diagonal (55.0)	LHA 4	5	CRT
50.80 x 19.05 (2.0 x 0.75)	LHA 4	10	LED	1403.35 diagonal (55.25)	LHA 4	5	CRT
55.56 x 17.15 (2.1875 x 0.625)	LHA 4	20	LED	1625.60 diagonal (64.0)	LHA 4	5	CRT
57.15 x 19.05 (2.25 x 0.75)	LHA 4	10	LED	1635.13 diagonal (64.375)	LHA 4	5	CRT
60.33 x 44.45 (2.375 x 1.75)	LHA 4	5	CRT	1714.50 diagonal (67.5)	LHA 4	10	CRT
68.26 x 23.81 (2.6875 x .9375)	LHA 4	20	LED				
77.79 x 15.88 (3.0625 x 0.625)	LHA 4	5	dLCD	104.78 x 19.05 (4.125 x 0.75)	LSD 44	24	LED
77.79 x 33.34 (3.0625x1.3125)	LHA 4	5	LED	196.85 x 127.00 (7.75 x 5.0)	LSD 44	32	EL
80.96 x 9.53 (3.1875 x 0.375)	LHA 4	10	dLCD	1263.65 x 1016.00 (49.75 x 40)	LSD 44	16	CRT
85.73 x 11.11 (3.125 x 0.4375)	LHA 4	5	LED				
85.73 x 25.40 (3.375 x 1.0)	LHA 4	20	LED	20.64 x 11.11 (0.8125 x 0.4375)	ARS 51	16	LED
90.49 x 9.53 (3.5625 x 0.375)	LHA 4	15	dLCD	41.28 diameter (1.625)	ARS 51	24	CRT
90.49 x 19.05 (3.5625 x 0.75)	LHA 4	5	LED	44.45 x 14.29 (1.75 x 0.5625)	ARS 51	8	LED
101.60 x 85.73 (4.0 x 3.375)	LHA 4	5	CRT	57.15 x 15.88 (2.25 x 0.625)	ARS 51	32	LED
103.19 x 25.40 (4.0625 x 1.0)	LHA 4	5	dLCD	63.50 x 19.05 (2.5 x 0.75)	ARS 51	72	LED
104.78 x 84.14 (4.125 x 3.3125)	LHA 4	10	CRT	66.68 x 14.29 (2.625 x .5625)	ARS 51	4	LED
114.30 x 85.73 (4.5 x 3.375)	LHA 4	10	CRT	69.85 x 34.93 (2.75 x 1.375)	ARS 51	4	LED
119.06 x 90.49 (4.6875x3.5625)	LHA 4	5	CRT	73.03 x 22.23 (2.88 x 0.88)	ARS 51	4	dLCD
123.83 x 19.05 (4.875 x 0.75)	LHA 4	10	LED	84.14 x 66.68 (3.3125 x 2.625)	ARS 51	4	CRT
127.00 x 73.03 (5.0 x 2.875)	LHA 4	5	dLCD	92.08 x 19.05 (3.625 x 0.75)	ARS 51	4	dLCD
149.23 x 196.85 (5.875 x 7.75)	LHA 4	5	CRT			12	LED
171.45 x 139.70 (6.75 x 5.5)	LHA 4	5	CRT	112.71 x 12.70 (4.4375 x 0.5)	ARS 51	4	LED
193.68 x 142.88 (7.625x5.625)	LHA 4	15	CRT	120.65 x 90.49 (4.75 x 3.5625)	ARS 51	4	CRT
196.85 diagonal (7.75)	LHA 4	5	CRT	142.88 x 31.75 (5.625 x 1.25)	ARS 51	4	LED
196.85 x 25.40 (7.75 x 1.0)	LHA 4	5	dLCD	150.81x185.74(5.9375x7.3125)	ARS 51	4	CRT
196.85 x 123.83 (7.75 x 4.875)	LHA 4	10	Plasma	163.51 x 12.70 (6.4375 x 0.5)	ARS 51	8	LED
200.03 diagonal (7.875)	LHA 4	15	CRT	222.25 x 222.25 (8.75 x 8.75)	ARS 51	8	Plasma
200.30 x 101.60 (7.886 x 4.0)	LHA 4	5	Plasma	411.16 diagonal (16.1875)	ARS 51	4	CRT
203.20 x 127.00 (8.0 x 5.0)	LHA 4	10	EL	504.83 diagonal (19.875)	ARS 51	4	CRT

642.94 diagonal (25.3125)	ARS 51	4	CRT	120.65 x 95.25 (4.75 x 3.75) 130.17 x 110.33 (5.13 x 4.34)	UC-26C	1	CRT
79.38 x 63.50 (3.125 x 2.5)	AS 39	4	CRT	130.97 x 130.97 (5.16 x 5.16)	UC-26C	1	EM
92.08 x 61.91 (3.625 x 2.4375)	AS 39	2	dLCD	203.20 x 171.45 (8.0 x 6.75)	UC-26C	1	EM
103.19 x 82.55 (4.06 x 3.25)	AS 39	1	Plasma				CRT
115.88 x 114.46 (4.56 x 5.69)	AS 39	2	CRT	170.18 x 170.18 (6.7 x 6.7)	C-40A	18	AMLCD
123.83 x 163.51 (4.88 x 6.44)	AS 39	4	AMLCD				
165.10 x 22.23 (6.5 x 0.875)	AS 39	8	CRT	144.78 x 238.25 (5.7 x 9.38)	AC-130H	54	CRT
223.84 diagonal (8.8125)	AS 39	2	CRT				
Table V (concluded). Display sizes unique to a given system (platform/program), one or more in quantity.							
127.00 x 114.3 (5.0 x 4.5)				HC-130H		2	EM
104.78 diameter (4.125)				LC-130R		8	CRT

Size, H x V mm (in) (unless otherwise noted)	Platform	No.	Technology	172.72 x 172.72 (6.8 x 6.8)	MC-130H	184	CRT
354.01x280.99(13.9375x11.063)	AS 39	4	CRT	25.40 diameter (1.00)	MC-130P	56	CRT
511.18 diagonal (20.125)	AS 39	4	CRT				
1133.48 diagonal (44.625)	AS 39	3	CRT	40.64 diameter (1.6) 105.00 diameter (4.13)	C-130H C-130H	16 161	LCD CRT
33.34 x 15.88 (1.3125 x 0.625)	PC 11	26	dLCD	113.79 x 87.63 (4.48 x 3.45)	C-130H	1120	AMLCD
57.15 x 25.40 (2.25 x 1.0)	PC 11	13	dLCD	124.65 diameter (4.91)	C-130H	161	CRT
60.33 x 14.29 (2.375 x 0.5625)	PC 11	26	dLCD	195.07 x 145.03 (7.68 x 5.71)	C-130H	119	CRT
60.33 x 17.15 (2.375 x 0.675)	PC 11	13	dLCD				
65.09 x 31.75 (2.5625 x 1.25)	PC 11	13	dLCD	11.11 x 7.94 (0.4375 x 0.3125)	C-141C	126	dLCD
66.68 x 25.40 (2.625 x 1.0)	PC 11	26	dLCD	22.23 x 11.11 (0.875 x 0.4375)	C-141C	252	LED
68.26 diameter (2.6875)	PC 11	13	CRT	63.50 x 60.33 (2.5 x 2.375)	C-141C	63	AMLCD
68.26 x 26.99 (2.6875 x 1.0625)	PC 11	13	dLCD	88.90 x 77.79 (3.5 x 3.0625)	C-141C	252	dLCD
73.03 x 53.98 (2.875 x 2.125)	PC 11	13	dLCD?	107.95 x 82.55 (4.25 x 3.25)	C-141C	189	dLCD
80.96 x 58.74 (3.1875 x 2.3125)	PC 11	13	AMLCD	149.23 x 200.03 (5.875x7.875)	C-141C	252	AMLCD
90.49 x 77.79 (3.5625 x 3.0625)	PC 11	26	dLCD				
100.01 x 30.16(3.9375x1.1875)	PC 11	13	dLCD	83.82 x 68.58 (3.3 x 2.7)	C-141B	200	AMLCD
101.60 x 28.58 (4.0 x 1.125)	PC 11	13	dLCD?				
149.23 x 17.15 (5.875 x 0.675)	PC 11	13	dLCD?	88.90 x 101.60 (3.5 x 4.0)	KC-10A	118	CRT
153.99 x 15.88 (6.0625 x 0.625)	PC 11	13	dLCD	122.17 x 103.12 (4.81 x 4.06)	KC-10A	118	EM
42.86 diameter (1.6875)	LCM 8	768	EM	57.15 x 60.33 (2.25 x 2.375)	T-3A	110	LED
79.38 diameter (3.125)	LCM 8	192	EM	95.25 x 82.55 (3.75 x 3.25)	T-3A	220	EM
85.73 x 22.23 (3.375 x 0.875)	LCM 8	96	dLCD	158.75 x 31.75 (6.25 x 1.25)	T-3A	110	LED
				158.75 x 50.80 (6.25 x 2.0)	T-3A	110	LED
98.43 x 79.38 (3.88 x 3.13)	Mark V boat	40	dLCD				
120.65 x 92.08 (4.75 x 3.63)	Mark V boat	40	dLCD	50.80 x 121.92 (2.0 x 4.8)	T-6A	1422	CRT
201.61 x 180.98 (7.94 x 7.13)	Mark V boat	20	CRT	96.52 x 48.26 (3.8 x 1.9)	T-6A	1422	CRT
220.66 x 165.10 (8.69 x 6.50)	Mark V boat	60	AMLCD				
				82.80 x 82.55 (3.26 x 3.25)	T-38A	386	EM
87.31 x 23.81(3.4375 x .9375)	LCU 1600	34	dLCD				
88.90 x 22.23 (3.5 x 0.875)	LCU 1600	34	dLCD	88.90 x 129.54 (3.5 x 5.1)	T-38C	850	AMLCD
196.85 x 260.35 (7.75 x 10.25)	LCU 1600	34	CRT				
				98.04 x 98.04 (3.86 x 3.86)	T-39N	34	CRT
228.60 x 228.60 (9.0 x 9.0)	C-5A/B/C 254	CRT		137.16 x 137.16 (5.4 x 5.4)	T-39N	17	CRT
101.60 x 79.38 (4.0 x 3.125)	C-12A	80	CRT	101.60 x 25.40 (4.0 x 1.0)	T-41D	3	Plasma
99.06 diameter (3.9)	C-17A	240	CRT				
190.50 x 63.50 (7.5 x 2.5)	C-17A	120	LED	114.30 x 79.38 (4.5 x 3.125) 215.90 diameter (8.5)	T-43A	12	CRT
107.95 x 66.68 (4.25 x 2.63)	C-21A	80	LCD				
66.80 x 151.89 (2.63 x 5.98)	C-22B	3	CRT	46.99 diameter (1.85) 105.66 x 105.66 (4.16 x 4.16)	T-45A	174	CRT
73.03 diameter (2.875)	C-26B	11	CRT			348	EM
80.96 diameter (3.1875)	UC-26C	1	EM				
85.73 x 85.73 (3.375 x 2.5)	UC-26C	1	EM				
107.95 x 128.59 (4.25x5.0625)	UC-26C	1	CRT				

Table VI. Singularities list. Display sizes of which there is only one in number in DoD.

Size, mm (in.) H x V (unless otherwise noted)	Platform	Current Technology
57.15 x 12.70 (2.25 x 0.5)	CV 67	dLCD
76.20 x 44.45 (3.0 x 1.75)	CV 67	dLCD
79.38 x 12.70 (3.125 x 0.5)	CV 67	LED
80.96 diameter (3.1875)	UC-26C	EM
80.96 x 63.50 (3.1875 x 2.5)	CV 67	dLCD
85.73 x 85.73 (3.375 x 2.5)	UC-26C	EM
92.25 x 76.20 (3.75 x 3.0)	CV 67	LED
98.43 x 73.03 (3.875 x 2.875)	CVN 65	CRT
103.19 x 82.55 (4.06 x 3.25)	AS 39	Plasma
106.36 x 82.55 (4.19 x 3.25)	CV 67	CRT
107.95 x 128.59 (4.25 x 5.0625)	UC-26C	CRT
114.30 x 17.46 (4.5 x 0.69)	CV 67	LED
120.65 x 95.25 (4.75 x 3.75)	UC-26C	CRT
130.17 x 110.33 (5.13 x 4.34)	UC-26C	EM
130.97 x 130.97 (5.16 x 5.16)	UC-26C	EM
136.53 x 30.16 (5.38 x 1.19)	CV 67	LED
146.05 x 112.71 (5.75 x 4.44)	CV 67	CRT
185.74 x 30.16 (7.31 x 1.19)	CV 67	LED
193.68 x 120.65 (7.63 x 4.75)	CV 67	dLCD
203.20 x 171.45 (8.0 x 6.75)	UC-26C	CRT
206.38 x 155.58 (8.13 x 6.13)	CV 67	AMLCD
212.73 x 158.75 (8.375 x 6.25)	CV 67	Plasma
227.01 diagonal (8.9375)	CV 67	CRT
238.13 x 174.63 (9.38 x 6.88)	CV 67	CRT
241.30 x 161.93 (9.5 x 6.375)	CV 67	CRT
241.30 x 184.15 (9.5 x 7.25)	CVN 65	CRT
241.30 x 209.55 (9.5 x 8.25)	CVN 65	CRT
244.48 x 158.75 (9.625 x 6.25)	CV 67	CRT
254.00 x 69.85 (10.0 x 2.75)	CVN 65	LCD
273.05 x 374.65 (10.75 x 14.75)	CV 67	CRT?
279.40 x 368.30 (11.0 x 14.5)	CVN 65	CRT
330.20 x 254.00 (13.0 x 10.0)	CVN 65	CRT
342.90 x 273.05 (13.5 x 10.75)	CVN 65	CRT
355.60 x 304.80 (14.0 x 12.0)	CVN 65	CRT
387.35 diagonal (15.25)	CV 67	CRT
419.10 x 323.85 (16.5 x 12.5)	CVN 65	CRT
438.15 diagonal (17.25)	CV 67	CRT
482.60 x 381.00 (19.0 x 15.0)	CVN 65	CRT
603.25 diagonal (23.75)	CV 67	CRT
698.50 diagonal (27.5)	CV 67	CRT

4. DISCUSSION

Key aspects of five example U.S. Navy, Army, Marine and Air Force programs are provided.

5.1 Bradley Fighting Vehicle

The Bradley Fighting Vehicle is comprised of four separate variants: M2A2 ODS, M2A3/M3A3, C2V and M7 FIST.

The full production run for the M2A2 ODS Bradley will be 1570 platforms, with 227 of these allocated to provide chassis for the M7 FIST variant.⁵ There are two electronic displays supporting the mission of this vehicle. The Digital Compass Display (DCD), otherwise known as the "Tac/Nav" display by vendor KVH Industries, Newport, Rhode Island, uses a housing enclosure measuring 4.88 x 5.00 x 1.55 in. (W x H x D). The technology is passive liquid crystal, utilizing back-light and heated back-plane. The Integrated Sight Unit (ISU) is a seven-segment light emitting (LED) diode array,⁶ composed of four segments, for use by the gunner. The LEDs are situated within an aperture measuring 0.65 x 0.21 in. The fielding of the Driver's Viewer Enhancer display, also intended for the M2A3/M3A3, has been suspended due to need for further development.

Regarding M2A3/M3A3, the M3A3 is a cavalry platform whereas the M2A3 is an infantry vehicle, both, however, using the same set of five electronic displays. Among these is the Improved Bradley Acquisition Sight (IBAS), using an embedded P-43 phosphor monochrome CRT with 10 shades of gray. A separate but similar CRT drives the imagery for the Commander's Independent Viewer (CIV).⁷ Yet other visual systems include the Commander's Tactical Display (CTD) and Squad Leader's Display (SLD), both having bezels measuring 11.0 x 9.5 in. Both are passive liquid crystal-based displays and can be operated in monochrome or color, with 81 color groups per inch, 32 undithered shades of gray, and 342.626 nits (100 ftL) luminance.⁸ Both the CIV and a Remote Biocular Viewer are provided imagery from the same color CRT. There is also a Driver's Navigation Display (DND), comprised of a passive monochrome LCD with backlight and heated back-plane, with a bezel measuring 4.88 x 5.00 in.

The C2V Bradley has a total of four electronic displays. One of these is the Commander's Display, based on thin film electro-luminescence technology, with an over-all footprint of 11 x 8 in. (W x H). There are otherwise three CRT-based Common Hardware Software displays, known as "CHS II," having 1280 x 1024 resolution, with an instrument footprint measuring 17.5 x 17.5 in. The C2V can actually be configured with up to four CHS II displays, with flat panel technology as an alternate. The current schedule calls for ten C2Vs delivered by FY2000 and the full 106 by FY2006.⁹

The M7 FIST program is currently in Engineering, Manufacturing and Development (EMD) stage. Four electronic displays are planned. One of these, using 1987 vintage passive liquid crystal technology, will part of the Forward Entry Device (FED), a militarized, portable 286 laptop computer. A second display, part of the Targeting Station Control Panel (TSCP), will employ monochrome electroluminescent technology for alpha-numerics, formatted in 13 lines of 23 characters, with an instrument footprint measuring 7.0 x 9.0 in. The Digital Compass Display (otherwise known as the "Driver's Navigational Display") comes from the ODS variant, unchanged. The Biocular Display Unit (BDU) will use CRT technology, with 800 active lines horizontal by 480 lines vertical resolution.¹⁰ Additionally, an A3 BFIST, based on the M2A3 chassis, is in early program stages. This will add 122 more vehicles to the FIST fleet. Final design had not been established as of Jan 99 when the M7 FIST was last reviewed.¹¹

5.2 Common Large Area Display Set (CLADS)

The Common Large Area Display Set (CLADS) initiative entails a joint upgrade of up to four aircraft, three USAF: E-3B/C AWACS, E-8C JSTARS, EC-130E ABCCC and one USN: E-2C Hawkeye, all sharing the common denominator of high-maintenance, low MTBF 19 in. CRTs.

The CLADS R & M Improvement Program Critical Design Review for E-3B/C occurred March 11, while the Preliminary Design Reviews for E-2C, E-8C and EC-130E occurred March 12, 1997 proposing form, fit function replacement of each aircraft's approximately 19 in. CRTs. The target display relative to E-3B/C is the Situation Display Console Color Monitor Assembly (footprint = 15.5 (w) x 18.25 (h) in.), of which there are 14 per aircraft (448 total across 23 B models and 9 C models), while that for Navy's E-2C is the Enhanced Main Display Unit (footprint = 21.75 (w) x 15.97 (h) in.),

of which there are three per aircraft (126 total across 42 aircraft). On the other hand, CLADS focusses on the Improved Graphics Displays (footprint = 20.25 (w) x 15.75 (h) in.) for USAF's fleet of 13 E-8C, of which there are 18 per aircraft (234 displays total). As to the ABCCC configuration, which is installed on eight of the 15 EC-130Es, each aircraft comprises 12 Battle Station Airborne Color Displays (BSACD). These are color CRTs supplied by Astronautics of America oriented in portrait mode, with noninterlacing raster. There are a total of 96 displays fleet-wide. The useful CRT area is 151.25 square inches with an active 17.6 in. diagonal (like the E-8 JSTARS displays). The maximum replacement assembly dimensions are 14.4 (w) x 17.7 (h), 22.81 in. diagonal and 21 in. depth at 15 degree angle.¹² The CLADS effort envisions replacing each of the aforementioned CRT displays with a commercial 21 in. diagonal 1280 x 1024, 24 bit, full color display using either AC Gas Plasma, AMLCD or other flat panel technology. Specified performance includes contrast of 10:1, 0.1 to 30 fL luminance, non-operating temperatures of -40 to +70C, 30 degrees horizontal/25 degrees vertical viewing angle and 3350 hours MTBF.¹³

5.3 Naval Special Warfare Rigid Hulled Inflatable Boat (11 meter)

In service since October 1998, the 11 m Naval Special Warfare Rigid Hulled Inflatable Boat (NSW RHIB) is an integral part of USSOCOM assets. All display modules are commercial grade equipment acquired at catalogue price with the ability to undergo the rigors of sea state four (6-10 foot waves) with water crashing over the console. The NSW RHIB program received the David Packard Award for excellence in acquisition, signed off by USD (A&T) Jacques Gansler on May 4, 1998. As of November 1998, there were twenty 11 m boats in service, with an additional 50 on order (a 10 m version of this craft, with the same display set, proved a failure under sea trials because of boat instability in rough seas). There are a total of three electronic displays on board. The 841 Radar display by Furuno, with 4.875 x 6.50 in. active area, is monochrome, using dichroic liquid crystal (dLCD) technology. The 1600 F GPS display, whose information is linked to the 841, is also monochrome dLCD, with a 3.5 x 4.75 in. active area, full sunlight readable but with off-axis viewability limited to approximately 45 degrees. The IC-M127 by ICOM, also dLCD, has a monochrome display with 3.0 x 1.5625 in. active area. Some RHIBs have the IC-M126 instead, but this has the same size display.¹⁴

5.4 Advanced Amphibious Assault Vehide (AAAV)

The AAAV Preliminary Design Review was completed in December 1997, with the first three prototypes scheduled to appear in June 1999 and another 11 to follow prior to low rate production start in 2003. Production will eventually ramp to 50 units per quarter until production completion in 2012, with 1013 total production vehicles.¹⁵ The displays have been described with the following performance features: 640 x 480 color groups (77 color pixels per inch) minimum resolution, 4:3 aspect ratio, quad or triad pixel arrangement, 60 Hz refresh and a minimum active viewing area of 10 x 8 in, as defined in the "Critical Item Development Specification." Full sunlight readability will be based on analysis of operating environment.¹⁶ As of January 1999, a somewhat altered display picture had evolved, where new requirements were envisioned for two separate platforms: large area displays for 78 AAAV (C) platforms and a suite of two 8 (w) x 5 (h) in. and two 10 (w) x 8 (h) in. displays for some 2 – 3,000 AAAV (P) platforms. Although the technology choice is currently AMLCD, it is already predicted this will change by the year 2000 when the program will have entered Engineering and Manufacturing phase. A trade-off study is currently due in the April-May 1999 time-frame.¹⁷

5.5 Joint Helmet Mounted Cueing System

Vision Systems, International (Kaiser/Elbit) is on contract to McDonnell Douglas (Boeing) to provide some 1750 display units for the Joint Helmet Mounted Cueing System. The display engine is to be a 0.5 in. diameter active area CRT provided by Hughes or Thompson (with an unspecified lower truncation). As of October 1997, when the program had achieved Critical Design Review for Engineering, Manufacturing and Development, the system was intended for the following aircraft: F-15 C/D, F-18 C/D/E/F and F-22, F-16 (Lockheed Martin, as associate contractor, will use GFE to provide JHMCS to these latter aircraft), with a delivery schedule as follows:¹⁸

	<u>FY01</u>	<u>FY02</u>	<u>FY03</u>	<u>FY04</u>	<u>FY05</u>	<u>FY06</u>	<u>FY07</u>	<u>FY08</u>	<u>FY09</u>	<u>FY10</u>
F-22	0	0	40	55	13	25	25	25	25	25
F-15	10	50	80	80	40	0	0	0	0	0
F-16	12	50	75	62	25	0	0	0	0	0

F-18 100 130 130 130 120 75 75 75 37

5. CONCLUSIONS AND RECOMMENDATIONS

The overall numbers of DoD military display sizes, programs and applied technologies are presented in this paper for those sizes representing demand of 5,000 units or greater. Our technical report includes all DoD military displays.¹

Regarding technologies, it is to be noted that across all DoD military systems, 46% of total displays are implemented with, or are planning to be implemented with, a form of flat panel. Within the flat panels, 76% are LCD, dLCD or AMLCD. That is, 35% of total DoD displays use, or plan to use, LCD flat panel technologies. Some 11% of total DoD displays use non-LCD flat panel technology, such as electroluminescent, thin film electroluminescent, light emitting diode or plasma, representing 0.9%, 1.7%, 6.2% and 2.3% of total DoD usage, respectively. Meanwhile, approximately 48% of DoD displays currently utilize a CRT implementation. The remaining 6% of total DoD displays are incandescent or electromechanical (to date, a coherent effort to gather information for electromechanical and incandescent displays has not been made; thus, future studies may show that this percentage is larger).

Given the dramatically smaller mean-time between failure rate of installed older technologies (CRT and EM, in particular), relative to flat panel technologies, coupled with a dwindling industrial base and consequently increasing per unit purchase price for the older technologies, it can be anticipated that the part of the current DoD inventory using older technologies will, at some point, require technology upgrade via form-fit or instrument panel re-design. It is, therefore, recommended that particular if not priority consideration be given to the process of replacing older technology displays. Such attention would reduce the number of systems that become unavailable for use (or are available with diminished operational capability) due to the vanishing vendor syndrome (VVS), which plagues the older technologies, CRT and EM, in particular.

Yet an additional factor in determining demand is the re-design and integration of control panels comprising switches and annunciator lights into large area direct view electronic multifunction displays for affordability and added capability.

The majority of display sizes are unique to a single DoD program. In fact, 515 out of 748 display sizes listed fit this category. An obvious recommendation stems from this observation: DoD program offices should, whether in acquiring new systems or upgrading those already fielded, capitalize on commonality by leveraging off existing or planned program acquisitions across all Services to reduce non-recurring engineering and maximize volume purchasing. Given the number of unique sizes, this approach would obviously mean fewer upgrades that are purely form-fit-function (hence of higher initial cost), while the long term prospect is greater savings over succeeding retrofits. We recognize that, short of an instrument panel redesign (partial or full), existing crewstation configuration imposes a limitation to the latitude any one program has in terms of display size conversion.

Some of the 748 display sizes currently in use can be logically grouped into size categories. Those specific sizes that are already the most prolific are identified. The 9.4 in. diagonal active area display, for instance, represents 3.7% of total DOD displays (97% of which are either AMLCD or dLCD). Also, the 5.0 x 5.0 in. size represents 3.4% (85% of which are currently CRTs). The 2.25 x 2.25 in. size accounts for 3.3% (99.5% of which are currently AMLCD). The 8.0 in. diagonal active area display represents 3.1% (of which 93.4% are AMLCD), while the 19.0 in. diagonal size represents 2.4% (of which 100% are CRT). The 12.1 in. diagonal size represents 2.3% (100% of which are AMLCD). This data, correlating sizes to technologies, should be used as baseline information ("what is") in any acquisition program involving displays (to decide "what will be").

The present results for display sizes signal the rallying point about which the process of achieving greater commonality can evolve. It is the recommendation of this report, both to DOD and industry, that they take advantage of this information to reduce, over time, the number of unique sizes.

6. ACKNOWLEDGEMENTS

The authors express their appreciation to the many Army, Navy, Marine and Air Force System Program Offices and Logistics Program Offices, as well as weapon systems contractors and display vendors in private industry which responded to requests for information by phone, fax, or e-mail. The large number of these instances is too large to mention here, there being approximately 424 information exchanges documented to date. However, we wish to give particular thanks to Tank Automotive Command (TACOM), Warren MI, COMNAVAIRLANT, COMNAVSURFLANT, COMPHIBGRU II, COMLOGGRU II, COMNAVSUBLANT and Special Boat Squadron II, for site visits aboard the M1A2SEP, CV 67, DDG 64, CG 69, LPD 15, LHD 3, LHA 4, ARS 51, LSD 44, LSD 51, LCM 8, AS 39, PC 11, NSW RHIB, LCU 1600 and Mark V Boat. These visits afforded an unsurpassable opportunity for data collection, as well as understanding the particular display/platform environment.

7. REFERENCES

- 1a. D.D. Desjardins and D.G. Hopper, "Military Display Market; First Comprehensive Edition," AFRL-HE-WP-TR-1998-0017 (1998), 296 pp. Available to qualified recipients from Natl Technical Information Service, Springfield, VA.
- 1b. D.D. Desjardins and D.G. Hopper, "Military display market assessment," in *Cockpit Displays V: Displays for Defense Applications*, Darrel G. Hopper, Editor, SPIE 3363, pp 21-32 (1998).
2. Dr. Joseph A. Castellano, "Trends in the Global Flat Panel Display Industry," Stanford Resources, Inc., San Jose CA., as presented at the USDC Investors' Conference '98. Some 88% of military display flat panels are either LCD or AMLCD according to D.D. Desjardins and D.G. Hopper, *ibid*, "Recommendations," p. 147.
3. USAF "Avionics Planning Baseline," ASC-TR-98-5063 (September 1998).
Published by ASC/LYA, 2145 Monahan Way (Bldg 28, Area B), Wright Patterson AFB OH 45433-7017.
4. U.S. Navy "Avionics Installation Plan, October 1996, published by Naval Air Warfare Center, Aircraft Division, 6000 East 21st St, Indianapolis IN 46219-2189. The current AIP system was disabled prior to 6 January 1997.
5. Telecon between Mr. Jim Yakel, Engineer, M7 FIST program, TACOM, Warren MI (DSN 786-5595) and Capt Dan Desjardins, WL/AAJD, Wright-Patterson AFB OH (DSN 785- 8269), 18 November 1996.
6. Fax from Mr. Greg Hatem, Engineer, Hughes Aircraft, El Segundo CA (310-616-5279) to Maj. Dan Desjardins, WL/AAJD, WPAFB OH (937-255-8269), 19 December 1996.
7. Telecon between Mr. Jim Gallagher, Project Engineer, AMSTA-TR-E/BDS, Bradley PMO, TACOM, Warren MI (810-574-5871) and Maj. Dan Desjardins, WL/AAJD, WPAFB OH (937-255-8269), 18 December 1996.
8. E-mail from Ms. Pam Browne, M2A3/M3A3 Program Office, TACOM, Warren MI (810-574-5535) to Maj. Dan Desjardins, WL/AAJD, WPAFB OH (937-255-8269), 3 December 1996.
9. E-Mail from Ms. Pam Browne, Bradley PMO, TACOM, Warren MI (810-574-8255) to Maj. Dan Desjardins, AFRL/HECV, WPAFB OH (937-255-4079), 25 January 1999.
10. Per endnote #5, same date.
11. Per endnote #8, same date.
12. Battelle, "Common Large Area Flat Panel Display Reliability and Maintainability Improvement Program," Preliminary Design Review document, 21 July 1994.
13. Battelle, March 12, 1997 PDR overview.

14. Face-to-face between Machine Repairman Chief Phil Navaock, Special Boat Unit 20, Naval Station Little Creek, Virginia (757-462-8204) and Maj. Dan Desjardins, AFRL/HECV, WPAFB OH (937-255-7886), 10 November 1998 aboard one of the NSW RHIBs in service with Special Boat Unit 20.
15. Telecon between Mr. Joe Teets, Director of Engineering, Marine Corps Advanced Amphibious Assault Vehicle Program Office at General Dynamics, Woodbridge VA (703-492-3395) and Maj. Dan Desjardins, AFRL/HECV, WPAFB OH (937-255-7886), 28 January 1998.
16. Telecon between Mr. Craig Lamont, Controls and Displays Engineer, Advanced Amphibious Assault Vehicle Program Office at General Dynamics, Woodbridge VA (703-492-3395) and Maj. Dan Desjardins, AFRL/HECV, WPAFB OH (937-255-7886), 30 January 1998.
17. Telecon between Mr. Dinos Tsagos, Systems/Computer Engineer, USMC, Arlington VA (703-492-3336) and Maj. Dan Desjardins, AFRL/HECV, WPAFB OH (937-255-4079), on or about 15 January 1999.
18. Telecon between Mr. Jim Barnaba, Lead Engineer, JHMCS System Program Office, WPAFB OH (937-255-7963) and Maj. Dan Desjardins, AFRL/AAJD, WPAFB OH (937-255-7886), 24 October 1997., 30 March 1998.